REMARKS

INTRODUCTION

In accordance with the foregoing, claims 1-5, 7-12, 14, 15 and 18 have been amended. Claims 6, 13, 16, 17 and 19-22 have been cancelled. Claims 1-5, 7-12, 14, 15 and 18 are pending and under consideration.

CLAIM REJECTIONS – 112

Claims 5 and 17 were rejected under 35 USC 112, first paragraph, as failing comply with the written description requirement.

Claims 1-22 were rejected under 35 USC 112, second paragraph, as being indefinite.

Regarding claim 1, claim 1 has been amended to omit reference to "compensating means."

Regarding claims 4 and 5, these claims have been appropriately amended to include structure to achieve the desired results.

Regarding claim 6, claim 6 has been cancelled.

Regarding claim 7, claim 7 has been rewritten as a method claim and reference to control means has been omitted. Support for the amendment to claim 7 may be found in at least Figure 4 of the present application.

Regarding claim 12, the base claim of claim 12 has been amended to include first and second visual sensors.

Regarding claims 13 and 17-21, these claims have been cancelled.

Withdrawal of the foregoing rejection is requested.

CLAIM REJECTIONS – 102 and 103

Claims 1 and 2 were rejected under 35 USC 102(b) as being anticipated by DiStasio et al. (US 6,430,474) (hereinafter "DiStasio").

Claims 3-6 were rejected under as being unpatentable over DiStasio in view of Lovchik et al. (US 6,244,644) (hereinafter "Lovchik").

DiStasio discusses a tooling adapter for allowing selected manipulation of a workpiece. In DiStasio, to manipulate or retrieve a workpiece, the manipulator device 2 places the tooling adapter 58 in sufficient close proximity to a workpiece in the workpiece source 4, and initiates a

vacuum operation that causes the vacuum ports 72 to draw the desired workpiece into contact with the base member 66. Once the manipulator device 2 has picked a desired workpiece, a camera from either reference imaging system 6 or 8 acquires image data associated with the selected workpiece. This data is conveyed to the controller 11, which determines the location and/or orientation of the workpiece. The controller 11 then provides instructions for moving the manipulator device 2 to ensure a workpiece placement accuracy of between about 5 microns and about 10 microns. When the manipulator device 2 places the workpiece upon the substrate at the desired location, the manipulator device 2 removes the vacuum pressure on the selected workpiece to allow the selected workpiece to remain on the substrate 18. DiStasio, 6:5-6:22 and Figures 3-6.

Lovchik discusses a compact dexterous robotic hand. In Lovchik, the compact robotic hand 10 includes a palm housing 16, a wrist section 12 and a forearm section 16. The palm housing supports a plurality of fingers 18, 20, 22 and one or more movable palm members 24, 25 that cooperate with the fingers to grasp and/or release an object. Each flexible finger 18, 20, 22 comprises a plurality of hingedly connected segments, including a proximal segment 16 pivotally connected to the palm housing. The proximal finger segment 16 includes at least one groove 122 defining first and second cam surfaces 126, 128 for engagement with a cable 60. A plurality of lead screw assemblies 54 each carried by the palm housing are supplied with power from a flexible shaft 92 rotated by an actuator 91, and output linear motion to a cable 60 move a finger. The cable 60 is secured within a respective groove 122 and enables each finger to move between an opened and closed position. A decoupling assembly 288 pivotally connected to a proximal finger segment enables a cable 60 connected thereto to control movement of an intermediate and distal finger segment independent of movement of the proximal finger segment. The dexterous robotic hand closely resembles the function of a human hand yet is light weight and capable of grasping both heavy and light objects with a high degree of precision. Lovchik, Abstract and Figure 2.

Claims 1-6

Amended claim 1 recites: "...the first robot controller drives the plurality of fingers to compensate for the displacement of the position/orientation of the object..." Support for the amendments made to claim 1 may be found at least at page 4, line 15 through page 8, line 5 of the present application. In contrast to claim 1, DiStasio does not discuss compensating for the displacement of the position/orientation of the object. In DiStasio, once the vacuum ports 72 draw the desired workpiece into contact with the base member 66, no further adjustment is made to

the workpiece. Claim 1 recites that plurality of fingers of the robot hand compensate for any displacement of the object. This deficiency in DiStasio is not cured by Lovchic. Although Lovchik discusses a robot hand having fingers, Lovchik does not discuss capturing an image of an object in the robot hand and then adjusting the fingers to compensate for displacement from a predetermined postion/orientation. As such, it is respectfully submitted that claim 1 patentably distinguishes over DiStasio and Lovchik.

Claim 6 has been cancelled. Claims 2-5 depend on claim 1 and are therefore believed to be allowable for at least the foregoing reasons.

Withdrawal of the foregoing rejection is requested.

Claims 7-12, 14, 15 and 18

Although claim 7 was not examined on the merits, it is respectfully submitted that as amended, claim 7 patentably distinguishes over the references relied upon by the Examiner. Support for the amendments to claim 7 may be found in at least Figure 4 of the present application. Claims 8-12, 14, 15 and 18 depend on claim 7 and are therefore believed to be allowable for the foregoing reason.

Withdrawal of the foregoing rejection is requested.

NOTE TO THE EXAMINER

In view of the extensive amendment to claims 1 and 7, clean versions of claims 1 and 7 are hereby listed for the convenience of the Examiner.

1. (Previously Presented) An object handling apparatus for handling an object to transfer the object from an object supply place to an install place of a machine with a predetermined position/orientation, the apparatus comprising:

a movable device adjacent to the object supply place delivering the object;

a first visual sensor provided at the movable device detecting a position/orientation of the object on the movable device;

a first robot picking up the object from the movable device based on position/orientation of the object output from the first visual sensor to a first robot controller, the first robot including a first robot hand, the first robot hand including a plurality of fingers for holding the object, wherein the fingers are driven by one or more servomotors controlled by the first robot controller so that a position and a force of gripping by the fingers on the object is controlled; and

a second visual sensor detecting a position/orientation of the object in the first robot hand, wherein

the detected position/orientation of the object held by the robot hand is output to the first robot controller from the second visual sensor,

the first robot controller calculates a displacement of the detected position/orientation of the object in the first robot hand from a predetermined position/orientation,

the first robot controller drives the plurality of fingers to compensate for the displacement of the position/orientation of the object, and

when the position/orientation of the object has been compensated for, the first robot delivers the object to the install place of the machine.

7. (Previously Presented) A method of transferring an object from an object supply place to an install place, comprising:

determining a position/orientation of the object at the object supply place with a first visual sensor, the first visual sensor being provided at the object supply place;

picking up the object with a first robot hand having a plurality of fingers based on the position/orientation of the object as determined by the first visual sensor;

moving the first robot hand to an image capturing position and determining a position/orientation of the object in the robot hand with a second visual sensor;

adjusting the plurality fingers of the first robot hand to compensate for a difference between the position/orientation of the object in the robot hand from the second visual sensor and a predetermined position/orientation of the object in the robot hand;

moving the first robot hand to the install place; and

opening the first robot hand and delivering the object to the install place.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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